OBSERVATIONS ON REPRODUCTION IN THE SNAIL GONIOBASIS*

BY DOROTHEA DOWD JEWELL

This study of reproductive organs, breeding habits and embryonic development of *Goniobasis livescens correcta* (Brot) has been carried on as a part of the larger problem of working out the life-history of this river snail. The material used for this study was obtained from the Salt Fork River east of Urbana, Illinois during the fall and spring of 1929-1930.

The writer wishes to express her sincere appreciation to Dr. H. J. Van Cleave, under whose direction this study was carried on, for his helpful suggestions throughout the investigation. She is indebted also to Mr. Frank Collins Baker for his kindly interest in the work and for identification of the snail studied. Mr. Calvin Goodrich has also kindly verified the identification of the variety under consideration.

Since the work of Stimpson, published in 1864, little has been done in the investigation of the reproduction of Goniobasis. Summarizing his own studies, Baker in the Fresh Water Mollusca of Wisconsin (Vol. 1, Page 176) comments on the pioneer work of Stimpson on the Pleuroceridae in the following words: "Half a hundred specimens of Pleurocera and Goniobasis have been examined without finding anything essential not indicated by this careful student." In the same reference, Baker further states that nothing is known concerning the development of members of this family.

The present study, by means of dissections and serial sections, has demonstrated conclusively that the sexes are separate. Specimens examined during the fall, winter and spring months invariably showed a single gonad with no evidence of hermaphroditism. Since there are no external genitalia in Goniobasis, the only observable difference in

*Contributions from the Zoological Laboratory of the University of Illinois No. 395.

the external form of living specimens of the two sexes is the presence in the female of a small pit located just posterior and lateral to the base of the right tentacle. The significance of this pit for sex recognition was pointed out as early as 1864 by Stimpson whose observations on this point are widely quoted but have never been extended further. The pit is bordered on either side by fleshy folds. Below the lower fold, a shallow groove extends posteriorly for a short distance. The corresponding region in the male is smooth, with no trace of pit or groove. The pit extends inward for some distance, but in the present investigation no connection has been found between it and the reproductive organs.

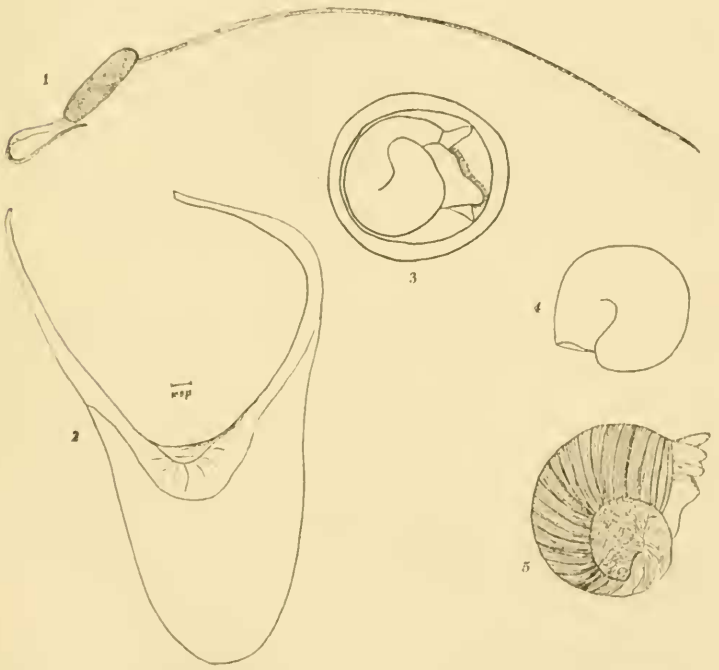
Dissections and microscopic examination of serial sections have shown only spermatozoa or only ova to be present in the gonad of each individual examined. In the fall the testes were packed full of mature spermatozoa appearing as a thick white substance. This condition was found also both in winter and spring when the testes were so distended that the slightest scratch ruptured them. Ova of various sizes were always present in the ovaries but, because of their minute size and the presence of much follicular material about them, examination of serial sections was necessary for absolute recognition of eggs before maturity.

Individual sperms have a distinctive form. The headpiece consists of a somewhat cylindrical portion (Fig. 1) about 5μ in length and bears a terminal hook-shaped structure. The entire head has a length of about 10μ. The tail is 50μ in length. Spermatophores of definite shape (Fig. 2), full of active spermatozoa, were found in the water in the snail containers in the laboratory during the latter part of March and in April. The spermatophores vary a little in size; one of average size measured 1.1mm. by 1.02 mm with a pair of thread-like arms about 1.19 mm. in length.

Eggs of this species have been unknown previously. They were deposited in the laboratory containers in the last week of March and during April and May. The eggs always appeared singly or in lines of two or three with no covering except the simple shell membrane which remained until time of

hatching. Little variation was found in the size of the newly laid eggs. The size most frequently found was 306μ as the diameter of the egg itself within a membrane of 382μ to 425μ in diameter.

The snails were observed for some time each day in an attempt to discover any evidence of copulation. Since these snails have a habit of crawling over each other, it has so far



Figs. 1-5, *Goniobasis livescens correcta* (Brot.) Fig. 1, A mature spermatozoön. Length of head 10μ; length of tail 50μ. Fig. 2, A spermatophore which was discharged into the water. Scale equals 100μ. Fig. 3, An 11-day embryo within its egg membrane. Fig. 4, Shell of a newly hatched snail. Fig. 5, A young snail three or four days after hatching.

been impossible to distinguish between their ordinary movements and those associated with copulation. When spermatophores were found near two associated individu-

als, these snails were removed to another container and kept under observation. Sometimes this mutual interest continued and another spermatophore or two appeared in the water, but no sign of external copulatory organs or of copulation other than mere contact was evident. The snails always dropped apart from each other immediately if disturbed even very slightly.

In a female dissected about the time of oviposition, mature spermatozoa were present in the upper end of the uterus. There were also present in this region strands of fiber which closely resembled bits of spermatophore. Although fertilization is probably internal, the lack of specialized intromittent organs often leads to the loss of some of the spermatophores into the water. It has not yet been possible to determine how the spermatophores are deposited or whether they enter the female pit or the uterus directly.

After once observing the eggs under laboratory conditions, the next objective was the discovery of the eggs in the natural habitat. The minute size of the eggs and the dense algal growth covering all the stones in the stream-bed rendered this a difficult task. On April 14th, Goniobasis eggs were found on rocks in the Salt Fork River. They were always in the same linear series of two or three or singly deposited as in the laboratory. These eggs were in early cleavage and veliger stages when discovered. Miss Margery Washburn, who co-operated in collecting the snails, reported that eggs were present on the rocks as late as the eighth of June.

Eggs laid in the laboratory were observed under the microscope at regular intervals. Observations concerning time for development were obtained by segregating snails and noting the time of appearance of eggs in the containers. In the first twenty-four hours after eggs appeared, those laid earliest were in the 32-celled stage. Rotating movements were observable within the egg membrane by the time the embryo was four days old and by the seventh day the veliger stage had been reached. At the beginning of the eleventh day some of the embryos observed had pushed out

one side of the membrane into a definite bulge or pouch (Fig. 3). By constant rotating movements and feeling out with foot and rostrum, the embryo moved into the bulge repeatedly until at last the membrane was ruptured freeing the young snail. The time for embryonic development of these snails under laboratory conditions was eleven and a half days.

The newly hatched snails varied slightly in size. The largest one measured was 425μ in its longest diameter on the ventral surface. The shell of a newly hatched snail measured 306μ by 348μ (Fig. 4.). One complete, finely reticulated whorl is present in the shell of the newly hatched snails as a rule, although there may in some cases be the beginning of a second whorl. As additional whorls are formed after hatching, their thin transparent walls show distinct cross-striations.

DESCRIPTION OF A NEW VARIETY OF VALVATA LEWISI CURRIER

BY FRANK COLLINS BAKER*

VALVATA LEWISI ONTARIENSIS, new variety.

Shell discoidal, of three whorls, the first one and a half or two flattened and coiled in the same plane, the last one or one and a half free from contact with the preceding whorls and rapidly descending, forming a rounded tube; sutures deeply impressed; sculpture fine and thread-like on the first two whorls, becoming heavier on the last whorl where they develop into sharp, elevated, rib-like lamellae which are more or less equally and rather widely spaced; aperture rounded; umbilical opening of the two first whorls shallow and wide.

Height 3.5; diameter 4.2 mm. Holotype.

Height 2.2; diameter 3.5 mm. Paratype.

---

*Contribution from the Museum of Natural History, University of Illinois, No. 64.